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10/682,275	10/08/2003	Daniel J. Zierath	42P15929	9333

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EXAMINER

BIRENBAUM, NIRA S

ART UNIT	PAPER NUMBER
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1742

DATE MAILED: 08/24/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/682,275

Applicant(s)

ZIERATH ET AL.

Examiner

Nira S. Birenbaum, Ph.D.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 08 March 2004.  
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.  
4a) Of the above claim(s) 12-30 is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1-11 is/are rejected.  
7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
8) ☒ Claim(s) 1-30 are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.  
10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_  
5) ☐ Notice of Informal Patent Application (PTO-152)  
6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Election/Restrictions*

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-11, drawn to a method, classified in class 205, subclass 81.
- II. Claims 12-22, drawn to a composition, classified in class 205 subclass 261.
- III. Claims 23-30, drawn to a product, classified in class 428, subclass 450.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process of making and composition made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different composition or (2) that the composition as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the composition can be made by a process which does not include the step of determining the concentration. For example, the composition could be found in a reference book.

Inventions II and III are related as a composition for making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the composition as claimed can be used to make other and materially different product or (2) that the product as claimed can be made using another and materially different composition (MPEP § 806.05(f)). In the instant case the composition can be used for electroplating on other types of surfaces, such as one without features..

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Inventions I and III are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the product can be made without predetermining the concentration of the plating solution.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

During a telephone conversation with Michael Bernadickou on August 11, 2005 a provisional election was made with traverse to prosecute the invention of I, claims 1-11. Affirmation of this election must be made by applicant in replying to this Office action. Claims 12-30 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

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The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 3, 5, 7, and 9 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The additive concentrations are claimed in units of "mL/L". However, no specific additives are referred to. Without knowing the exact identity of a compound, a claim which refers to concentration in units of "mL/L" is indefinite.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reid *et al.* (US 2001/0015321) in view of Lowenheim (*Electroplating* McGraw-Hill Book Company, New York: 1978, p. 201-202).

Reid teaches a process for electroplating integrated circuit devices using a high-acid plating bath composition which includes a suppressor and chloride ions (see Table 1). Reid also teaches that these additives reduce electroplating defects (paragraph 31). Although Reid does not expressly teach that the presence of chloride catalyzes the suppressor, this is a known, inherent property of the electroplating solution composition taught by Reid. For example, Lowenheim teaches that in order for plating solution

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additives to work properly, a small amount of chloride must also be in the solution. (See pg 202, paragraph 2).

However, these references do not expressly teach determining the concentrations of suppressor and chloride such that the concentrations are sufficient to prevent plating defects.

It would have been obvious to one of ordinary skill in the art to optimize the concentrations of suppressor and chloride in the plating solution of Reid in view of Lowenheim, because Reid teaches that the concentration of suppressor is a result-effective variable (Table 6). See MPEP 2144.05 II.

Regarding claim 2, Reid teaches that the suppressor reduces pit defects (Table 5).

Regarding claim 3, Reid teaches that the concentration of suppressor can be 1-6 mL/L, which overlaps with the claimed range. See MPEP 2144.05 I.

Regarding claim 4, it would have been obvious to one of ordinary skill in the art to optimize the concentration of suppressor in the plating solution of Reid, because Reid teaches that the concentration of suppressor is a result-effective variable (Table 6). See MPEP 2144.05 II.

Regarding claim 5, Reid teaches that the concentration of chloride can be 20-200 mg/L, which contains the claimed range.

Regarding claims 6 and 7, Reid teaches that a leveler can be included in the solution in order to reduce the within die thickness variation. However, Reid does not expressly teach determining the concentration of leveler such that the within die

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thickness variation is reduced to certain value. It would have been obvious to one of ordinary skill in the art at the time of the invention to optimize the concentration of leveler in the plating solution of Reid in view of Lowenheim, because Reid teaches that the concentration of leveler is a result-effective variable (paragraph 20). See MPEP 2144.05 II.

Regarding claim 8, Reid teaches that an accelerator can be included in the electroplating solution. However, Reid does not expressly teach determining the concentration of accelerator based on the chloride and leveler concentrations. It would have been obvious to one of ordinary skill in the art at the time of the invention to optimize the concentration of accelerator in the plating solution of Reid in view of Lowenheim, because concentration is a result-effective variable. See MPEP 2144.05 II.

Regarding claim 9, Reid teaches that the accelerator concentration can be 0.5 – 8 mL/L (which encompasses the claimed range) while the chloride concentration is greater than 30 mg/L.

Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reid in view of Lowenheim as applied to claim 1 above, and further in view of Barstad *et al.* (US 2001/0047943).

Reid and Lowenheim teach the features as previously described. However, these references do not teach that the chloride concentration should be determined based on a characteristic of the substrate.

Barstad teaches a solution for electroplating copper with an increased concentration of brightener. The increased concentration allows for better filling of small

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aspect ratio vias (paragraph 48). Furthermore, Lowenheim teaches that chloride is necessary to active organic additives in copper baths such as brighteners (pg 202.) Because, as taught by Barstad, the concentration of brightener can vary depending on the substrates features, it follows that the concentration of chloride would also vary depending on the substrate features, since the chloride is necessary to active the brightener as taught by Lowenheim. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to optimize the chloride concentration in the plating solution so that it would be sufficient to activate the brightener for a given feature size.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nira S. Birenbaum, Ph.D. whose telephone number is (571) 272-8516. The examiner can normally be reached on M-F 8:00 am - 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on (571) 272-1244. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.



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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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